

CLAIM AMENDMENTS

IN THE CLAIMS

This listing of the claims will replace all prior versions, and listing, of claims in the application or previous response to office action:

1-26. (Cancelled).

27. (Currently Amended) A multistage scrubber for removing sulfur dioxide from flue gas comprising:

[[(a)]] a vertically-oriented shell, the shell having an upper end and a lower end, the shell further having a flue gas entry port located at the lower end and a flue gas exit port located at the upper end such that the flue gas enters the shell via the flue gas entry port and moves in counter-flow exchange to a fluid, the shell further having an interior cavity, a vertical axis, and an interior surface;

[[(b)]] N number of liquid distributor headers within the interior cavity of the shell, so located such that the liquid distributor headers are capable of receiving fluid, wherein N is greater than 1 and wherein the liquid distribution headers are numbered from 1 to N;

[[(c)]] a plurality of liquid distributors, the liquid distributors in fluid communication with the liquid distributor headers and capable of distributing fluid from the liquid distributor headers to the interior cavity of the shell;

[[(d)]] N-1 number of scrubber stage separators numbered 2 to N along the vertical axis, each of the scrubber stage separators located in a plane substantially perpendicular to the vertical axis, each scrubber stage separator having an upper surface;

packing arranged within the interior cavity of the shell, the packing located above at least one of the scrubber stage separators, wherein the packing includes a pressure drop of less than 0.5 inches of water/foot of packing height;

[[(e)]] a plurality of fluid exit ports, each fluid exit port capable of withdrawing liquid from the upper surface of a particular scrubber stage separator;

[[(f)]] N number of stages numbered 1 to N wherein each of the stages numbered 2 to N comprises the correspondingly numbered liquid distribution header, the correspondingly numbered scrubber stage separator, and at least one of the fluid exit ports and

stage 1 comprises the correspondingly numbered liquid distribution header and at least one fluid exit port; and

[[(g)]] a scrubber product line, the scrubber product line capable of removing fluid from the multistage scrubber.

Claim 28. (Cancelled)

29. (Currently Amended) The multistage scrubber of claim 27 [[28]], wherein the packing is wire gauze packing.

Claim 30. (Cancelled)

31. (Currently Amended) The multistage scrubber of claim 27 [[28]], wherein packing is comprised of austenitic stainless steel.

32. (Currently Amended) The multistage scrubber of claim 27 [[28]], wherein the interior surface of the shell is comprised of rubber, glass, epoxy, stainless steel, zirconium, or Hastelloy C276.

33. (Original) The multistage scrubber of claim 27 further comprising a liquid repository, the liquid repository located within the interior cavity of the shell at the lower end of the shell.

34. (Original) The multistage scrubber of claim 27, wherein the liquid distributors comprise nozzles.

35. (Original) The multistage scrubber of claim 27, wherein the liquid distributors connected to the liquid distributor header of scrubber stage 1 comprise nozzles.

36. (Original) The multistage scrubber of claim 27, wherein each of the liquid distributor headers are perpendicular to the vertical axis of the shell.

37. (Original) The multistage scrubber of claim 27 further comprising:

N-1 number of tanks numbered from 2 to N, each tank having an interior surface and further having a fluid discharge port, each tank in fluid communication with the correspondingly numbered liquid distributor header; and

N number of liquor removal lines numbered from 1 to N, each of N liquor removal lines connected to the correspondingly numbered stage through at least one fluid exit

port, such that a fluid path exists through each correspondingly numbered liquor removal line into the correspondingly numbered tank.

38. (Original) The multistage scrubber of claim 37, wherein the interior surface of each of the tanks is comprised of stainless steel, epoxy, rubber, or Hastelloy.

39. (Original) The multistage scrubber of claim 37 further comprising:

N number of water lines numbered 1 to N, each water line capable of providing fluid to the correspondingly numbered liquid distributor header;

N number of ammonia headers numbered 1 to N, each ammonia header capable of providing fluid to the correspondingly numbered liquid distribution header.

40. (Original) The multistage scrubber of claim 27 further comprising:

N-1 number of drain headers, where each drain header is capable of transferring fluid between a selected stage and at least one other stage.

41. (Original) The multistage scrubber of claim 40, wherein each of the drain headers is capable of transferring fluid from a selected stage and a lower numbered stage than the selected stage.

42. (Original) The multistage scrubber of claim 40, wherein the drain headers are numbered 2 to N-1, and further wherein n is an integer counter having a value of between 2 and N-1 (2, 3, 4...N-1), further wherein the n numbered drain header is capable of transferring fluid from the n numbered stage to the n-1 numbered stage.

43. (Original) The multistage scrubber of claim 40 further comprising a liquid repository, the liquid repository located within the interior cavity of the shell at the lower end of the shell, and wherein the drain headers are numbered 2 to N-1 and further wherein n is an integer counter having a value between 3 and N-1 (3, 4, 5...N-1), further wherein the n numbered drain header is capable of transferring fluid from the n numbered stage to the n-1 numbered stage, further wherein the number 2 drain header is capable of transferring fluid from the number 2 stage to the liquid repository.

44. (Currently Amended) A multistage scrubber for removing sulfur dioxide from flue gas comprising:

a shell having a first end and a second end, the shell including a flue gas entry port disposed at the first end and flue gas exit port disposed at the second end ~~wherein a fluid moves in relation to the flue gas to provide counter-current exchange as the flue gas traverses through the shell~~, the shell further defined in part by an interior cavity and an interior surface;

N number of liquid distributor headers within the interior cavity of the shell, so located such that the liquid distributor headers are capable of receiving a fluid, wherein N is greater than 1 and wherein the liquid distribution headers are numbered from 1 to N;

a plurality of liquid distributors, the liquid distributors in fluid communication with the liquid distributor headers and capable of distributing fluid from the liquid distributor headers to the interior cavity of the shell, wherein the fluid comprises a recirculated fluid with water, ammonia or ammonia liquor, but not oxygen, added;

N-1 number of scrubber stage separators numbered 2 to N along the vertical axis, each of the scrubber stage separators located in a plane substantially perpendicular to the flow of the flue gas, each scrubber stage separator having an upper surface;

a plurality of fluid exit ports, each fluid exit port capable of withdrawing liquid from the upper surface of a particular scrubber stage separator;

N number of stages numbered 1 to N wherein each of the stages numbered 2 to N comprises the correspondingly numbered liquid distribution header, the correspondingly numbered scrubber stage separator, and at least one of the fluid exit ports and stage 1 comprises the correspondingly numbered liquid distribution header and at least one fluid exit port; and

a scrubber product line, the scrubber product line capable of removing fluid from the multistage scrubber.

45. (Previously Presented) The multistage scrubber of claim 44, wherein the N-1 number of scrubber stage separators includes a packing set.

46. (Previously Presented) The multistage scrubber of claim 44, wherein the packing set comprises wire gauze packing.

47. (Currently Amended) The multistage scrubber of claim 45, wherein the packing ~~set includes is selected based on having~~ a pressure drop of less than 0.5 inches of water/foot of packing height.

48. (Previously Presented) The multistage scrubber of claim 45, wherein the packing set is comprised of austenetic stainless steel.

49-117 (Cancelled)